AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.
1791 Tullie Circle, NE Atlanta, GA 30329 404-636-8400

TC/TG/TRG MINUTES COVER SHEET

(Minutes of all meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/TRG NO. TC 7.5 DATE: July 27, 2007

TC/TG/TRG TITLE: Smart Building Systems

DATE OF MEETING: January 30, 2007 LOCATION: Dallas, TX

Members Present	Appt	Members Absent	Appt	E-Officio Members and Additional Attendance
Michael Brambley, Chair, Research Subc. (V)		Osman Ahmed (CM)		James Earley
Robert Old, (V)		John House, Handbook (CM)		Sira Gopalnarayanan
Steve Blanc, (V)		Agami Reddy (CM)		Patrick Hughes
Michael Brandemuehl (V)		Xiaohui Zhou, (CM)		Haorong Li
James W. Gartner (V)		Chariti Young, (CM)		Damian Ljungquist
Rich Hackner, Building/utility Interface Subc., (CM)		Narendra Amarani, (CM)		Scott Mitchell
Carol Lomonaco, Program Subc., (V)		Dave Branson, (CM)		John Murray
Jin Wen, FDD Chair, (V)		Marty Burns, (CM)		Mike Porter
Peng Xu Vice Chair, Research Subc., (V)		Jim Butler, (CM)		Gene Strehlow
James Braun (V)		Charles Culp, (CM)		Meli Stylianou
Bill Healy, Wireless Application Subc (V)		Arthur Deter, (CM)		Kris Subbarao
Jonathan Wright, IM (V)		Piotr Domanski		Shengwei Wang
Vernon A. Smith (CM)		Mohsen Farzad		Jerry While
Carlos Haiad (CM)		Mark Johnson, (CM)		Ashish Singhal
Glenn Remington (CM)		David Kahn, (CM)		Shengwei Wang
Jerine Ahmed (CM)		Michael Kintner-Meyer,		Jeffrey Schein
Keith Temple (CM)		Mingsheng Liu, (CM)		Vance Payne
Gene Strehlow (CM)		Darrell Massie, (CM)		
Haorong Li (CM)		John Mitchell , (CM)		
David Bornside (CM)		Ron Nelson, (CM)		
Barry Bridges (CM)		Hung Mahn Pham, (CM)		
Srinivas Katipamula (CM)		Kinga Porst, (CM)		
Natascha Castro, Web Master, (CM)		Mike Pouchak, (CM)		
		Andrew Price, (CM)		
		Barry Reardon, (CM)		
		Glenn Remington, (CM)		
		Todd Rossi, (CM)		
		Pornsak Songkakul (CM)		
		James Winston, (CM)		

(V) = voting member
CM = corresponding member
(Voting and Corresponding Members are for the period from July 1, 2006 through June 30, 2007.)

DISTRIBUTION:
ALL MEMBERS AND CORRESPONDING MEMBERS OF TC/TG/TRG,
TAC CHAIR: Patricia Graef
TAC SECTION HEAD: Janice Peterson
ALL COMMITTEE LIAISONS AS SHOWN ON TC/TG/TRG ROSTERS:

Program: William Klock	Standards: Jerry W. White Jr.
Research: Patrick Hughes	Special Publications: Harvey Sachs
CTT: Joseph Anderson	Staff Liaison (Stds): Claire Ramspeck
Prof. Dev.: Gordon Holness	Staff Liaison (Resch/Tech Srvc): Michael Vaughn

ASHRAE TC Activities Sheet

DATE: January 30, 2007
TC NO. TC 7.5 TC TITLE: Smart Building Systems
CHAIR: Mike Brambley VICE CHAIR: Peng Xu

TC Meeting Schedule

Location, past 12 mo.	Date	Location, net 12 mo.	Date
Quebec City	6/27/06	Long Beach	6/26/07
Dallas	1/30/07	New York	1/24/08

TC Subcommittees

Subcommittee	**Chair**
Secretary	M. Kintner-Meyer
Fault Detection and Diagnostics	J. Wen
Wireless Applications	B. Healy
Building/Utility Interface	R. Hackner
Research	P. Xu
Program	C. Lomonaco
Handbook	J. House

Program List for 2007 Long Beach Meeting:

Title	**Chair**	**Status**
"Automated Fault Detection and Diagnostics (FDD)" – Transactions Session	John House	
"Wireless Control Network Reliability and Security" - Forum	Cliff Federspiel	

Current Research Projects

Current Research Projects Technology Development Subcommittee

1275-RP "Evaluation and Assessment of Fault Detection and Diagnostic Methods for Centrifugal Chillers – Phase II" (Phil Haves – PMSC Chair)
Completed. PMS recommended approval by TC with edits.

Testing and Evaluation
1274-RP "Field Performance Assessment of Package Equipment to Quantify the Benefits of Proper Service" (Todd Rossi – PMSC Chair)

1312-RP, "Tools for Evaluating FDD Methods for AHUs" – WS-1312. Contractor Selection in Denver. (Phil Haves, PMSC Chair)

2006 – 2007 Research Plan

Proposed Priority	Old Priority	Project	Contributors	Status
1	1	Fault Detection and Diagnostics for Centrifugal Chillers – Phase 3: Real-Time Implementation	WS Contributors Srinivas Katipamula. RTAR Contributors: Srinivas Katipamula, John House, Todd Rossi, Jim Braun, Natascha Castro	Draft WS developed. Final draft is pending submission of 1275-RP report. TC 8.2 approved for co-sponsorship at the Quebec City meeting. TC 8.2 provided comments on what type of chillers we need to tested. WS will be revised and submitted later.
3	2	FDD for Supermarket Refrigeration	RTAR Contributors Daniel Choinere and John House	Approved in Denver. Discussed in Quebec City. Revised work statement to be drafted for Dallas. TC 10.7 is assisting and will cosponsor. Rolls off the RAC list in August 2007. Need to narrow the scope a bit. John House will provide another draft in Long Beach meeting.
4	3	Development of metrics to evaluate benefits of sensor networks in buildings (new title)	RTAR Contributors Jin Wen and Agami Reddy. Revised by Bill Healy	Approved by full TC in Denver with minor revisions. Received comments from RAC and will be revised accordingly. Vote at TC meeting to be resubmitted
5	4	"What If" Emulation Tool for Training and Strategizing on Building Operations	Steve Blanc	Received comments. Need to define a clear application, education, FDD? Steve will revise the document.
9	5	Status and benefits of demand response program for residential buildings	Jin Wen, Srinivas, Bill, Palieuta,	More work
8	6	Locate and identify IEEE 802.15.4 RF sources	Bob Old	Need justification and value to ASHRAE. Need a clear HVAC application.
11	7	Demand response optimization protocol and integrated training	Rich Hackner	More work
6	8	Whole-Building FDD	Les Norford	On hold. Les is still interested in pursuing the idea.
7	9	Conceptual Design of a Self-Configuring HVAC Control System	Michael Kintner-Meyer	Revised draft WS discussed in Denver. Revisions planned. Tabled indefinitely. The RTAR has rolled off the RAC list.

Technical Papers from Sponsored Research

RP-1011

Kintner-Meyer, M, Burns, M. 1999. "Utility/Energy Management and Control Systems (EMCS) Communication Protocol Requirements" Final report for ASHRAE Research Project RP-1011. Available on the TC 7.5 web site.

Kintner-Meyer, M.; Burns, M. 2000. Utility/Customer Information Services Part1: Descriptions of Services and Discussion on Interoperability for Service Implementation. ASHRAE Transactions. Vol. AT-01-0-0. American Society of Heating, Refrigeration, and Air-conditioning Engineers, Inc., Atlanta, GA.

Kintner-Meyer, M. Burns, M. 2000. *Utility/Customer Information Services Part 2: Data Object Modeling and Mapping to BACnet*. ASHRAE Transactions. Vol. AT-01-0-0. American Society of Heating, Refrigeration, and Air-conditioning Engineers, Inc., Atlanta, GA.

RP-1020

Norford, L. K., J. A. Wright, R. Buswell, and D. Luo. 2000. "Demonstration of Fault Detection and Diagnosis Methods in a Real Building (ASHRAE 1020-RP)." ASHRAE 1020-RP Final Report.

Luo, D., L. K. Norford, S. R. Shaw, and S. B. Leeb. 2002. "Monitoring HVAC Equipment Electrical Loads from a Centralized Location - Methods and Field Test Results." ASHRAE Transactions Vol. 108(1).

Shaw, S. R., L. K. Norford, D. Luo, and S. B. Leeb. 2002. "Detection of HVAC Faults via Electrical LoadMonitoring." International Journal of HVAC&R Research, 8(1):13-40.

Norford, L.K., J. A. Wright, R. A. Buswell, D. Luo, C. Klaassen, and A. Suby. 2002. "Demonstration of Fault Detection and Diagnosis Methods for Air-Handling Units (ASHRAE 1020-RP)." International Journal of HVAC&R Research, 8(1):41-72.

RP-1043

Bendapudi, S., Braun, J.E., and Groll, E.A., “A Dynamic Model of a Centrifugal Chiller System – Model Development, Numerical Study and Validation,” ASHRAE transactions, Vol. 111, Pt. 1, 18 pages, 2005.

Final report for ASHRAE Research Project RP-1043, " Fault Detection and Diagnostic Requirements and Evaluation Tools for Chillers" is available on the TC 7.5 web site.

Technical paper from 1043-RP, Comstock, M.C., Braun, J.E., and Groll, E.A., “The Sensitivity of Chiller Performance to Common Faults,” International Journal of HVAC&R Research, Vol. 7, No. 3, pp. 263-279, 2001.

Technical paper from 1043-RP, Comstock, M.C., Braun, J.E., and Groll, E.A., "A Survey of Common Faults for Chillers," ASHRAE Transactions, Vol. 108, Pt. 1, 2002.

RP-1139

Andersen, K.K., and Reddy, T.A., 2002. "The Error in Variable (EIV) Regression Approach as a Means of Identifying Unbiased Physical Parameter Estimates: Application to Chiller Performance Data", International Journal of HVAC&R Research, vol.8, no.3, pp. 295-309, July.

Reddy, T.A. and Andersen, K.K., 2002. "An Evaluation of Classical Steady-state Off-line Linear Parameter Estimation Methods Applied to Chiller Performance Data", International Journal of HVAC&R Research, vol.8, no.1, pp.101-124.

Reddy, T.A., Niebur, D., Andersen, K.K., Pericolo, P.P. and Cabrera, G., 2003. "Evaluation of the Suitability of Different Chiller Performance Models for Online Training Applied to Automated Fault Detection and Diagnosis", International Journal of HVAC&R Research, Vol.9, No.4, pp. 365-384, October.

Reddy, T.A., Andersen, K.K. and Niebur, D., 2003. "Information Content of Incoming Data During Field Monitoring: Application to Online Chiller Modeling", International Journal of HVAC&R Research, Vol.9, no.4, pp.385-414, October.

TC Sponsored Symposia (past 3 years, present, planned)

Title	**Date** (Given or Planned)
Automated Functional Testing: Methodologies and Air-Handling Unit Applications (House)	Orlando, 1/05
Software Tools for Enhanced Building Operation (House)	Dallas, 1/07

TC Sponsored Seminars (past 3 years, present, planned)

Title	**Date** (Given or Planned)
Improved Operations for California Buildings -Part 1 (Haiad, TC 7.4 lead)	Anaheim, 1/04
Improved Operations for California Buildings -Part 2 (Scruton, co-sponsored with TC 7.4)	Anaheim, 1/04
Automated Commissioning Tools (Maria Corsi, co-sponsored with TC 7.3)	Anaheim, 1/04
State of the Art Issues for DDC Systems (Atkinson, TC 1.4 lead)	Anaheim, 1/04
Models for Automated Building/HVAC Fault Detection and Diagnostics (Brambley, co-sponsored with TC 4.7)	Nashville, 6/04
Demand Response and Building Control (Xu, TC 7.4 lead)	Nashville, 6/04
Control Challenges and Opportunities with Emerging DDC Technologies (Bridges, TC 1.4 lead)	Orlando, 1/05
Future Intelligent Control Systems: They are Here Today (Braun, TC 7.4 lead)	Orlando, 1/05
Load Management: Why You Should Care and What Technology is Emerging (Katipamula, TC 1.4 and TC 7.4 co-sponsor)	Chicago, 1/06
User Experience with HVAC Fault Detection and Diagnostics – Part 1 (Cherniack, TC 1.4 and 7.6 co-sponsor)	Quebec City, 6/06
User Experience with HVAC Fault Detection and Diagnostics – Part 2 (Thomle, TC 1.4 and 7.6 co-sponsor)	Quebec City, 6/06

Emerging Wireless Technologies (Brambley)	Dallas, 1/07
Approaches to Deploying Wireless Technologies (Wen)	Dallas, 1/07
Fault Detection and Diagnostics – But What About Correction (Katipamula)	Dallas, 1/07

TC Sponsored Forums (past 3 years, present, planned)

Title	**Date** (Given or Planned)
Achieving Market Acceptance of HVAC Fault Detection and Diagnostic Systems (Goetzler, co-sponsored with TC 7.4)	Orlando, 1/05
What the utility wants to do to your building and how you will benefit (Kintner-Meyer, TC 7.4 co-sponsor)	Denver, 6/05
Wireless Sensing and Control: Where is it Needed and What Should it Control? (Brambley, TC 1.4 co-sponsor)	Chicago, 1/06
Fault Detection and Diagnostics: Are You Ready to Put it in Your Building? (Brambley, TC 1.4 and 7.6 co-sponsor)	Dallas, 1/07

TC Sponsored Public Sessions (past 3 years, present, planned): None

Journal Publications (past 3 years, present, planned): None

ASHRAE TC 7.5, Smart Building Systems

January 30, 2007

Call to Order, Roll Call, Introductions

The meeting was called to order at 3:40 PM with Chairman Mike Brambley presiding. Mike distributed copies of the agenda, and the agenda was projected for all to see. Mike pointed out that since distributing the agenda by email, the following changes were made:

1. All research projects were moved to the report by Peng Xu on the Research Subcommittee meeting.
2. The name of the Program Subcommittee chair was corrected to Carol Lomonaco and the program plans to be discussed were updated to Long Beach and New York.

Roll call was taken with 11 of 12 voting members in attendance.

Voting members present:	Steve Blanc (joined at 4:11pm) Michael Brambley, Michael Brandemuehl, James Gartner, Bob Old, Rich Hackner, Carol Lomonaco, Jin Wen, Peng Xu, Jim Braun, Bill Healy, Jonathan Wright (International Member).
Voting members absent:	Todd Rossi

Approval of Minutes

Brambley distributed copies of the Quebec City Meeting minutes.
Motion: Motion to approve the minutes of the Quebec City meeting by Peng Xu and seconded by John Wright.
Discussion:
Vote: 8-0-0; chairman voting.

Chair's Announcements – Mike Brambley

Mike Brambley handed out the agenda and reported on the Section 7 meeting. Janice Peterson, Section Head of Section 7 joined the meeting with no special announcements. The following announcements were made:

- Program information.
    - Some technical sessions will be held at the Expo at this ASHRAE meeting.
    - Furthermore, for the first time there was a technical plenary session, which was held on Sunday.
    - All speakers for program sessions must have submitted their presentations 24 hours in advance. The morning of the presentation is too late and causes difficulty in managing the clearing process.
    - There is a new policy regarding free registration, which will become effective for the Long Beach meeting. It can be summarized as follows:
        - Paper authors will receive full meeting registration
        - Seminar speakers and forum moderators will receive free registration for the day of their sessions
        - Transactions session and seminar chairs will not receive any free registration.

A discussion ensued regarding the fairness of this new policy. It was mentioned that transaction session (formerly symposia) chairs should receive, at least, a free one-day pass for the day of the symposium because of the significant effort required to organize a transaction session. Other voices objected to the seminar chair registration policy. There is a lack of volunteers for seminars and the new free registration policy will worsen the problem. The TC 8.2. vice chair reported that his TC made a motion to push back against the free-registration policy.

Motion: Moved by Michael Brandemuehl that the Chair of TC 7.5 write a letter to the Chair of TAC and the Section 7 Program Liaison expressing the TC's concern that the new free registration policy will hurt the Society Program and should be reconsidered. Jim Gartner seconded the motion. The motion was amended to read "TC 7.5 Chair will write a letter to TAC Chair and Program Liaison expressing the TC's concern that the new free registration policy will hurt the Society and that the current registration policy be continued."
Vote: 8-0-1. With Chair abstaining.
Action: Mike Brambley will get the letter out within a week.

- Mike Brambley reported that the themes have been selected for the Long Beach Annual Meeting in June 2007 and the New York City Winter Meeting 2008. They will be Natural Ventilation (LB) and Zero Energy Design (NY).
- For the New York City Meeting, programs may be need to be submitted by December 1, 2007, for review by NY Board of Engineering for review and approval to qualify for professional development hours (PDH) credit.

- All TCs have been asked to review the definition of "net zero energy building". The proposed definition is "a building which, on an annual basis, uses no more energy than is provided by the building's on-site renewable energy sources." More information is provided in the "New Business" section.

- Chapter Technology Transfer Committee (CTTC) has scheduled a satellite broadcast/webcast titled "Indoor Environmental Design: Practical Solutions to Everyday Problems." It will be held on April 18, 2007, 1:00 to 4:00 PM Eastern Daylight Time. Information is available at www.ashrae.org/IEDbroadcast. Registration opens on March 1. A flyer was circulated.

- GAME—Greening ASHRAE Meetings & Expositions—is available at this meeting. It provides the opportunity for a small fee ($11) for each attendee to buy carbon credits to offset the carbon emissions associated with attending the meeting. A flyer was circulated.

- Volunteers are sought for the Solar Decathlon. A brochure is available on the ASHRAE web site.

- ASHRAE is looking for new Distinguished Lecturers.

- TAC has asked TCs to review and comment on portions of the *MasterFormat*™ related to the committee's activities. Mike explained that *MasterFormat*™ is a standard published by the Construction Specifications Institute (CSI) in the U.S. and the Constuctions

Specifications Canada (CSC) in Canada, which is used by government agencies and private industry to assign numbers and titles in construction documents. A flyer with further information and instructions for responding was circulated around the room to meeting attendees.

Action: Bob Old volunteered to review the CSI Master Format and provide comments to the TAC. Due Date February 28, 2007.

- Two new TRGs are looking for members:
    - TRG 7 - Sustainable Building Operation. Contact Tony Jacobi, TAC Coordinator
    - TRG 4 - Sustainable Building Guidance and Metrics

- Award Nominations are being accepted for:
    - ASHRAE Technology Award – Contact JR Anderson at cttc7@ashrae.net
    - Hightower Technical Achievement Award – Not awarded this year. There were three nominations. None were accepted. Nominations are due before the October Tech Weekend.

- Funding for research is available, and TCs are encouraged to finalize and submit RTARs and Work Statements, especially on reaching net zero energy buildings by 2020.

- Natascha Castro announced that TC 7.5 is running this meeting as a (semi-) paperless meeting. Uploading and downloading of files can be performed.. The majority of members had signed into the subcommittee meetings already electronically and are now familiar with the process. Help can be provided to others and a limited number of paper copies of documents are available to participants who do not have computers with wireless capabilities with which to connect and download documents. In addition, we will be projecting pages of documents under discussion.

Fault Detection and Diagnostics Subcommittee – Jin Wen

The subcommittee meeting on Sunday meeting reviewed the following ongoing research projects:

1. 1274 RP, "Field Performance Assessment of Packaged Equipment to Quantify the Benefits of Proper Service." [PMSC Chair: Todd Rossi]

2. 1312 RP, "Tools for Evaluation FDD for AHUs" [PMSC Chair, Phil Haves]

A draft work statement, titled "**WS Chiller Phase III – Fault Detection and Diagnostics for Centrifugal Chillers, Phase III: Real Time Implementation"** , is a follow on to the ongoing 1275 RP project. Discussed was if there is sufficient specificity or if more detail is required. **Action:** Peng Xu will talk to TC8.2 to elicit feedback on this work statement by March 2007 deadline.

Srinivas Katipamula requested that contractor and PMS are requested to submit appropriate close-out forms to ASHRAE for Project 1275.

A brief discussion followed whether or not the final report had been approved by the TC. Phil

Haves indicated that TC had approved the final report. Steve Blanc made the following motion.

Motion: Moved by Steve Blanc that the TC7.5 approve the final report of ASHRAE Project 1275 Second by Jin Wen.
Discussion: none
Vote: 10-0-1. Chair not abstaining.

Srinivas continued with the discussion on the draft work statement. Discussed if the work statement should include specific coverage of a range of equipment or if this would be too constraining for the bidder. Suggestions were made that the contractor during the performance of the research should come back to the TC or PMS discussing the major findings of the top 3 chiller problems and that at this time final decisions on the specific tool development targets and methods be made. There was significant discussion on various aspects of the specificity issue.
Action: Revise work statement such that the bidder is required to specify the methods to use for the field test. Revision of the work statement will be voted on by email ballot. It was suggested that the revisions do NOT require a re-vote by TC 8.2

Motion: Moved by Jin Wen that TC7.5 approve the work statement with some re-wording and correct the format. Second by Mike Brandemuehl.
Discussion: It was mentioned that the executive summary needs to be requested in the work statement.
Vote: 10-0-1. Chair abstaining.

The RTAR titled "A Building Systems Emulation Tool for Building Operators", championed by Steve Blanc was discussed with several comments and suggestions for revisions for the Long Beach Meeting. TC 1.4 provided feedback and comments on the RTAR requesting clearer definition on the scope of the work.

The RTAR titled "FDD for Supermarket 1429" championed by John House was discussed. Jin reported that John House who was not present at the meeting, has not received sufficient feedback from TC 10.7. John House offered to do more work on the RTAR and requested further input by interested members. The deadline for the first draft work statement is August 15, 2007. Phil said that he would be happy to work with John House. No further actions.

The RTAR titled "Real-Time Optimal Control in Distributed Environments" championed by Jon Wright was discussed. Jon requested support for development of a work statement. Jon reported that TC7.5 already approved work statement in 2003. It was suggested that the work statement be approved during the Summer Meeting. Prior to that co-sponsorship by TC7.4 should be sought.

PES for the RTAR "Real-Time Optional Control in Distributed Environments" was formed with Srinivas Katipamula as chair. Members of this PES are: Phil Haves and Mike Brandemuehl. Two additional member are sought from TC8.2.

Wireless Applications Subcommittee – Bill Healy

Bill Healy discussed RTAR 1430: "Development of Metrics to Evaluate Benefits of Sensor Networks in Buildings". This RTAR was originally approved by the TC in Denver and returned by RAC with comments in November 2005. Bill has made revisions to the RTAR in response to comments.
Motion: Moved by Bill Healy that TC7.5 approve RTAR 1430 to be resubmitted. Second by Peng Xu,
Discussion: It was mentioned that TC1.4 and TC1.5 are co-sponsors of this RTAR.
Vote: 9-0-1, Chair abstained.

Bill Healy discussed the RTAR by Bold Old titled "Locating and Identifying IEEE 802.15.4 RF Sources". It was suggested to articulate the HVAC/R focus. Bob will refine the RTAR with comments from others.

Bill Healy discussed the renovation of ASHRAE headquarters. An ad hoc technical committee has been formed to assist with this construction project, and Mike Brambley has been asked as the subject matter expert related to the Living Laboratory. The purpose of the Living Laboratory is to turn the ASHRAE headquarters into a venue where ASHRAE members can carry out research (in addition to serving ASHRAE's activities). As one aspect of this project, ASHRAE is considering instrumenting the building. Wireless sensor technology has been proposed to be installed. There may be research opportunities that ASHRAE would be willing to fast track to implement on this building. Any ideas should be sent to Mike and Peng Xu ASAP (at least within the next 2 weeks). One or two paragraphs describing research projects that would take place on the headquarters would be welcomed, including research related to the proper use of wireless technology. Any ideas as such should be sent to Mike Brambley and Steve Taylor.

Building/Utility Interface Subcommittee – Rich Hackner

Rich reported on the highlights of the subcommittee meeting. Discussions were on Jin Wen's draft RTAR titled "Status and Benefits of Demand Response Programs for Residential Buildings". She will refine the draft for the Summer Meeting.

Peng Xu described ASHRAE's long-term sustainability and zero-energy goal, which is from the Terry Townsend agenda.

Further discussed was the policy pertaining to authors of work statement bidding on ASHRAE research projects. No further actions.

Research Subcommittee – Mike Brambley for Keith Temple who filled in for Todd Rossi

1274-RP

Mike Brambley reported that at the PMS meeting in Quebec City, the project was in disarray. The field measurement protocol had been found deficient after many units had been measured in the field, and the PMS was concerned about the statistical significance of results based on only the units remaining to be measured. The PMS meeting at the Dallas Meeting showed significant improvement in the project status. The project appears to be on a much more successful course. The expected statistical significance of results based on the remaining measurements was checked and the remaining sample size found to be sufficient. The field measurement protocol had been revised. Some additional changes in approach were recommended by the PMS at this meeting and a plan put in place to help the contractor be ready to restart field measurements by May. Part of the success since Quebec City was due to Keith Temple and Todd Rossi working

closely with contractor staff to address key issues. The project is on course again but a no-cost time extension is needed to allow time for collection of all field data.

There was some concern expressed by the PMS members about a lack of participation by some PMS members. Currently four members regularly attend the meetings of the PMS.

Motion: Moved by Steve Blanc to ask ASHRAE to extend the contract for 1274 RP by 1 year to April 30, 2008. Second by Bill Healy.
Discussion: None.
Vote: 10-0-1, Chair abstaining.

1312-RP

Phil reported that the project started 9/2005 and it is expected to end on 8/31/2007. A no-cost extension will be required. Progress is generally good.

Program Subcommittee – Carol Lomonaco
Jin Wen led the discussion of program topics for the upcoming meetings. The following programs were proposed as the prioritized program plan for Long Beach:

Priority 1: "Control Network Faulty Behavior " – Forum (Chair: Cliff Federspiel)

No priority: "Automated Fault Detection and Diagnostics" – Transactions Session (Chair: John House)

Hackner also reported that House is planning a symposium for Long Beach titled "Software Tools for Enhanced Building Operations."

Motion: Move to approve the prioritized program plan for Long Beach. Motion: Cliff Federspiel; Second: Jim Gartner.
Vote: 10-0-0; chair abstaining.

Handbook Subcommittee Report – John House (Les Norford substituting for John House)
Norford will be gathering information for revising Chapter 38 for the 2007 Application. Contributions by TC 7.3 will be recognized.

Web – Natascha Castro

The format of the TC7.5 website has improved matching the style of other TCs. Subcommittee chairs are requested to select material and content for posting on the website.

Action: Mike Brambley asked the subcommittee chairs to provide content to web master. Material for posting includes: draft minutes labeled as DRAFT.

Homeland Security
None

Old Business

Nothing to report.

New Business

1. Net zero energy buildings definition. Mike Brambley will send out definition to our distribution list and ask for comments. Comments will be sent to ASHRAE for alignment with ASHRAE's sustainability goals.
2. Thanks to Natascha for the first paperless meeting. Mike Brambley wants everyone to bring the laptops to the next meeting.
3. Glen mentioned the sustainability activities in Region V. Detroit will organize a conference on this topic.

Move to adjourn by Steve Blanc, seconded by Carol Lomonaco

Adjourn
Motion: Move to adjourn. Motion: Steve Blanc; Second: Carol Lomonaco.
Vote: Motion approved by unanimous voice vote.

A. Appendices
B. Call to Meeting and Agenda
C. Scope and Organization
D. Fault Detection and Diagnostics Subcommittee Meeting
E. Wireless Applications Subcommittee Meeting
F. Building/Utility Interface Subcommittee Meeting
G. Research Subcommittee Meeting
H. Program Notes
I. 1274-RP PMSC Notes
J. 1275-RP PMSC Notes
K. 1312-RP PMSC Notes
L. List of Subcommittee and Committee Attendees

Appendix A
TC 7.5 Call to Meeting and Agenda

ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

1791 Tullie Circle, NE, Atlanta, Georgia 30329-2305 404-636-8400 | Fax 404-321-5478

Reply to: Mike Brambley
K5-16, PO Box 999
Pacific Northwest National Laboratory
Richland, WA 99352

January 15, 2007

Dear TC 7.5 Member, International Member, or Corresponding Member:

The **TC** on Smart Building Systems will meet in Dallas according to the following schedule:

TC 7.5	**Smart Building Systems**	**Tuesday**	**3:30-6:00p**	**Lone Star C1**
TC 7.5	Fault Detection & Diagnosis	Sunday	3:00-4:00p	San Antonio A (C3)
TC 7.5	Wireless Applications	Sunday	4:00-5:00p	San Antonio A
TC 7.5	Building/Utility Interface	Sunday	5:00-6:00p	San Antonio A
TC 7.5	Research	Monday	2:00-3:00p	Trinity 4 (H3)
TC 7.5	1312-RP PM	Tuesday	8:00-9:30a	State 2 (C3)

TC 7.5 is sponsoring the following program sessions:

Transactions Session 15: Software Tools and Methodologies for Enhancing Building Operation
Tuesday, January 30, 2007, 7:45 AM – 9:15 AM, Adam's Mark Hotel, Dallas Ballroom D3 (CC/1),
Chair: John House

Seminar 53. Emerging Wireless Technologies Part 1: Basics
Wednesday, January 31, 2007, 7:45 AM – 9:15 AM, Adam's Mark Hotel, Dallas Ballroom D3 (CC/1),
Chair: Carol Lomonaco

Seminar 61. Emerging Wireless Technologies Part 2: Applications
Wednesday, January 31, 2007, 9:30 AM – 10:30 AM, Adam's Mark Hotel, Dallas Ballroom D3 (CC/1),
Chair: Michael Brambley

Attached is a draft of the agenda for the full TC 7.5 committee meeting.

ASHRAE TC 7.5, Smart Building Systems
2007 Annual Meeting
Dallas, TX

AGENDA

DRAFT AGENDA

Location: **Adam's Mark Conference Center**
Date: **Tuesday, January 30, 2007**
Time: **3:30 - 6:00 p.m.**

1. Roll Call and Introductions
2. TC 7.5 Scope
3. Approval of Quebec City Minutes
4. Announcements
5. Fault Detection and Diagnosis Subcommittee (Jin Wen)
6. Wireless Applications Subcommittee (Bill Healy)
7. Building/Utility Interface Subcommittee (Rich Hackner)
8. Research (Peng Xu)
    - Report on 1274-RP "Field Performance Assessment of Package Equipment to Quantify the Benefits of Proper Service" (Todd Rossi – PMSC Chair)
    - Report on 1312-RP "Tools for Evaluating Fault Detection and Diagnostic Methods for Air-Handling Units" (Phil Haves – PMSC Chair)
9. Program (Carol Lomonaco)
    - Plans for Long Beach and New York
10. Handbook (John House)
11. Web page (Natascha Castro)
12. Homeland Security
13. Old Business
14. New Business
15. Adjournment

Appendix B.
TC 7.5, Smart Building Systems Scope and Organization
Revised July 1, 2001

Overall Committee Scope

The Technical Committee on Smart Building Systems (SBS), TC 7.5, is concerned with the development and evaluation of technologies that could enable the widespread application of smart building systems. “Smart” buildings should take advantage of automation, communications, and data analysis technologies in order to operate in the most cost-effective manner. This implies integration of building services such as HVAC, fire, security, and transportation; the automation of many of the operation and maintenance functions traditionally performed by humans; and the interaction with outside service providers such as utilities, energy providers, and aggregators. Currently, three subcommittees form the backbone of the TC’s activities: fault detection and diagnostics, wireless applications, and building/utility interface.

Appendix C.
TC 7.5 Fault Detection and Diagnostics Subcommittee Meeting

Dallas, Texas: Sunday, January 28, 2007, 3:00-4:00pm

Jin Wen (Chair) began the meeting with a review of the meeting agenda and presented the list of ongoing research projects:

3. 1274 RP, "Field Performance Assessment of Packaged Equipment to Quantify the Benefits of Proper Service." [PMSC Chair: Todd Rossi]

4. 1312 RP, "Tools for Evaluation FDD for AHUs" [PMSC Chair, Phil Haves]

Srinivas Katipamula presented a draft work statement which has been under development as a follow on to the finished project 1275 RP, "**2005-75 WS Chiller Phase III – Fault Detection and Diagnostics for Centrifugal Chillers, Phase III: Real Time Implementation."** The main comments that arose out of discussions are as follows:

- Final report of Phase II has been reviewed and accepted by PMS. However, PMS needs to provide a final closure form.
- This work statement should be submitted by March, 2007.
- Guidance from TC 8.2 (Centrifugal Machines) is still in need to decide whether the size/type of the chillers could be specified. Xu will contact TC 8.2 to seek their advices.
- More discussion is needed in the main committee meeting about the scope of this WS after guidance is obtained from TC8.2.

The second item of business was a discussion of draft RTARs:

1. "**A Building Systems Emulation Tool for Building Operators**" [RTAR Champion: Steve Blanc]
    - Background: a "what-if emulator for buildings" that helps training, operation, and FDD- connected to the real building operation system. Not a proof of concept, but how to develop something that can be turned into a tool- a high-order specification. Only software development in this project.
    - Contributions have been made by Holmberg, Haves,
    - Comments from the discussion:
    - 1) This RTAR should include multiple phases with a clear application description: training operators; FDD testing; etc.
    - 2) A revised RTAR is to be prepared for further discussion either in the main research meeting or in the Long Beach meeting;
2. 1429-"**Fault Detection and Diagnostic Methods for Supermarkets**" [RTAR Champion: John House
    - John House is absent and Jin Wen reported the status of the RTAR based on John's email;
    - Background: this is an approved RTAR, which aims at identifying common supermarket faults.
    - John has solicited opinions from TC 10.7 and others about whether this RTAR should focus on refrigeration or whole building;
    - WS is due by August 15, 2007.

3. WS "**Real Time Optimal Control in a Distributed Environment**" [RTAR approved 2003, Champion: Jonathan Wright] – sponsored with 7.4
    a. Background: Examine the feasibility and benefit of using distributed real-time optimal control (intelligent agent) in building control and operation area
    b. Need approval to be a co-sponsor in the Long Beach meeting

The third item of business was a discussion of new research ideas.

1. Katipamula: we have focused on chillers and cooling system during the past. Should we start to look at FDD needs in heating systems including boilers.

Currently, no expertise in heating system is identified in TC 7.5. Wen will attend TC 1.4 meeting and seek expertise there.

2. Xu: simultaneous heating and cooling fault. Clifford volunteered to write a RTAR on this topic. Xu will follow up on Clifford.

The fourth item of business was a discussion of program. Future program ideas include:

1. Transactions on FDD
    - Chair: John House
    - Long Beach meeting
2. Seminar: *FDD…Fault Detection and Diagnostics…but What about "Correction?"*
    - Brought up by Srinivas and Shengwei Wang will follow up the actions on this seminar
3. (Future) Seminar: *Building Emulation (7.4)*
    - Chair: Xu
    - Steve Blanc has at least three speakers

Appendix D.
TC 7.5 Wireless Applications Subcommittee

ASHRAE TC 7.5, Smart Building Systems
2007 Annual Meeting
Dallas, TX

Date: Sunday, January 28, 2007

Meeting convened at 4:10
Bill Healy discussed the background of the committee. Draft scope is given as:

Draft Scope:

The Wireless Applications Subcommitee of TC 7.5: Smart Building Systems explores the use of wireless communications technology for enabling smart building systems. The aim of this subcommittee will be (a) to sponsor research to understand the performance, benefits, and drawbacks of wireless communications in buildings and to enhance the impact of wireless technology in building operations, and (b) to organize programs that inform ASHRAE members of advances in wireless technology and that provide those members with experiences and guidelines in using wireless technology for building applications.

Review of current research ideas:

Bill Healy discussed RTAR 1430: Development of metrics to evaluate benefits of sensor networks in buildings. This RTAR was originally approved by the TC in Denver and returned by RAC with comments in November 2005. Bill has made revisions to the RTAR in response to comments. A vote on resubmitting the revised RTAR to RAC will be held at the main TC meeting.

No update has been given on proposed RTAR: Control network faulty behavior. The general idea of this RTAR is to determine the effect on control systems of potential reliability problems in wireless data transmission in control systems. Anyone interested in assisting should contact Cliff Federspiel.

Bob Old discussed a new draft RTAR: "Locating and Identifying IEEE 802.15.4 RF Sources" The general aim of the RTAR would be to develop ways to automatically locate wireless points over the air. Comments from the audience indicated that the RTAR needs to be very focused on the HVACR community so that RAC will approve it. Carol Lomonaco indicated that she could get a volunteer to assist. Mike Brambley volunteered to review the final RTAR. The RTAR is still under development; Bob has listed a number of questions that he has in development of the RTAR and seeks input. Any comments should be referred to Bob Old.

New business:

Mike Brambley discussed the renovation of ASHRAE headquarters. An Ad hoc technical committee has been formed to assist with this construction project, and Mike has been tabbed as the subject matter expert related to the Living Laboratory. The

purpose of the Living Laboratory is to turn the ASHRAE headquarters into a venue where ASHRAE members can carry out research (in addition to serving ASHRAE's activities). As one aspect of this project, ASHRAE is considering instrumenting the building. Wireless sensor technology has been proposed to be installed. There may be research opportunities that ASHRAE would be willing to fast track to implement on this building. Any ideas should be sent to Mike and Peng Xu ASAP (at least within the next 2 weeks). One or two paragraphs describing research projects that would take place on the headquarters would be welcomed, including research related to the proper use of wireless technology. David Holmberg indicated that the BACnet committee is discussing wireless applications of BACnet, including the implementation of ZigBee. Any ideas as such should be sent to Mike Brambley and Steve Taylor.

Program:

- This meeting:
  - Seminar 53 Wed. 7:45 -9:15 am:
    Emerging Wireless Technologies I: Basics
  - Seminar 61 Wed. 9:30 – 10:30 am:
    Emerging Wireless Technologies II: Applications

Previously listed planned seminars "Practical experience of wireless and control networks in building" and "Wireless Applications" will be put on hold since the seminars held this meeting will cover these topics. Some other applications can be considered at later meetings.

Carol Lomonaco mentioned a possible seminar on "Characterization of Wireless BAS Systems." She has identified one possible speaker. Bob Old may be able to get a volunteer. David Holmberg mentioned that some companies are producing wireless BACnet products. These three could hopefully provide leads for a seminar.
A forum had been proposed on "Control Network Faulty Behavior" by Cliff Federspiel. Cliff was not at the subcommittee meetings, but Bill will check with him to see if he is interested in carrying out this program. Discussion also took place about the fact that many buildings have 802.11 capabilities; can sensor networks be built upon this infrastructure, and what limitations are there.

Bill Healy mentioned the possibility of examining RFID technologies in a seminar. An example would be the use of RFID technology in sensors. A potential contact for setting up such a seminar would be Gregor Henze, who wrote an RTAR on RFID for TC 7.4.

Meeting adjourned at 5:00

Appendix E.
TC 7.5 Building/Utility Interface Subcommittee Meeting

2007 ASHRAE Winter Meeting, Dallas, Texas – January 29th, 2007

The meeting began at 5:00 p.m. with about 15 people in attendance. Please refer to the main TC committee minutes for attendance list.

Rich Hackner, the sub-committee chair, began the meeting. This is third meeting for the subcommittee. The objectives of the sub-committee are:

> This new subcommittee will explore and develop ideas and research work statements to improve the building and utility interactions (and more specifically the electric grid). The research will focus on developing enabling technologies for seamless interaction of smart building components and utilities and other building services. An important aspect of this work is to identify the information that is necessary to support smart building technologies, and to identify the requirements of communication protocols to support the exchange of this information between different building services, between buildings and utilities, between multiple buildings, with outside service providers.
>
> The importance of a stable and reliable electric power grid to life and the economy in the 21st century has been underscored by two major events over the last decade: a major black out on the east coast of North America and wildly varying electricity prices in California during an attempt at restructuring the electricity marketplace. In response to these events many organization (DOE, EPRI, and CEC) have started research activities to find ways to modernize the grid. However, there are significant gaps in the research activities, especially as they relate to buildings. Since buildings consume over 70% of the electric in the U.S., they have to part of the solution to modernize the grid. ASHRAE has traditionally developed technologies, standards, and guidelines for buildings. Therefore, this subcommittee can play a major role in continuing this effort.

After introducing the objectives the sub-committee chair listed two potential research topics for discussion:

- Building response/control for scheduled and unscheduled power interruptions, especially prioritization of loads, equipment and control, when they occur (i.e. when power goes "off"), including integration of UPS systems.

- Building/controls response when power comes back "on." One example, how can buildings "soft re-start" after a power outage that is either of short (less than an hour) or long duration (several hours)

Discussion centered on the establishment of the building baseline and verification of

load reduction during a control event. At issue was the difficulty in re-establishing a building baseline over the course of the control event. Some utilities do “after the fact” reconciliation of demand reduction based on billing meter history. However, if a building is to be controlled in real time then more immediate feedback on what the load reduction target at any given moment is needed throughout the course of the control event. Another issue that was discussed was the need for randomization of load start up following a control event to avoid “tripping” the system and to ease the system back on-line. After much discussion about the above topics, the committee decided that we need more focused ideas.

Jin Wen then introduced an RTAR that she had drafted entitled “Status and benefits of demand response programs for residential buildings.” Jin led a discussion on the expansion/introduction of automated meter reading and “Smart Thermostats” that are being deployed by many utilities. Jin is looking for comments on the RTAR between now and the next meeting. Glenn Remington, Carlos Haiad, and Bill Pienta offered to review the RTAR and provide comments.

Rich Hackner introduced a draft RTAR entitled “Demand Response Optimization Protocol and Integrated Training. The objectives of the project would be to document the wealth of ASHRAE and other research that has considered individual demand response and demand control optimization strategies. And to develop a protocol for building owners/operators to “calibrate” their building to determine the steps that they should take to minimize their energy and demand costs within their building. Srinivas Katapamula, Glenn Remington, Carlos Haiad, and Bob Old offered to review the RTAR and provide comments. Also, it was recommended that Rich forward the RTAR to Patrick Hughes, Section 7 Research Liaison, for his comments.

Appendix F.
TC 7.5 Research Subcommittee Meeting

Minutes

Monday, January, 2007, 2:00 – 3:00 p.m.
2006 Annual Meeting
Dallas
Minutes

The meeting convened at approximately 2:10 p.m. chaired by Peng Xu

1. The first order of business was to review the agenda a revise if necessary. Copies of the agenda were distributed, after which Mike asked if there were any proposals for revisions. Mike wants to add a strategic research plan at the end. Glenn Remington want to discuss his new research idea of Outside air demand responsive control.

2. Announcements: The second order of business was announcements. Peng ask Research Subcommittee to review the updated reports for the various topical subcommittees on their research and then for the Research Subcommittee chair to provide a summary report on the status of research at the full committee meeting.

   Also mentioned was the move of the research subcommittee meeting to Monday at 2:00 p.m. to provide more time for the topical subcommittees to cover all of their business on Sunday.

3. PMSC Reports on Research Projects: The third order of business was review of the status of the ongoing research projects, reports of which follow.

   a. 1274-RP: Field Performance Assessment of Package Equipment to Quantify Benefits of Proper Service (Todd Rossi, PMSC Chair). Todd Rossi was unable to attend the meeting, but the meeting of the PMS for 1274-RP with the contractor was held Sunday evening. Mike Brambley reported on that meeting for Keith Temple as follows.

      When the PMS met in Quebec City, the project was in disarray. The field measurement protocol had been found deficient after many units had been measured in the field, and the PMS was concerned about the statistical significance of results based on only the units remaining to be measured. The PMS meeting at the Dallas Meeting showed significant improvement in the project status. The project appears to be on a much more successful course. The expected statistical significance of results based on the remaining measurements was checked and the remaining sample size found to be sufficient. The field measurement protocol had been revised. Some additional changes in approach were recommended by the PMS at this meeting and a plan put in place to help the contractor be ready to restart field measurements by May. Part of the success since Quebec City was due to Keith Temple and Todd Rossi working closely with contractor staff to address key issues. The

project is on course again but a no-cost time extension is needed to allow time for collection of all field data.

There was some concern expressed by the PMS members about a lack of participation by some PMS members. Currently four members regularly attend the meetings of the PMS.

ACTION: PMS will approve a new protocol by the end of March. PMS request ASHRAE to make one year no cost extension by April 2008. PMS will discuss whether TC should request ASHRAE restart the payment. Hold PMS conference call.

b. 1275-RP: Evaluation and Assessment of Fault Detection and Diagnostic Methods for Centrifugal Chillers—Phase II (Phil Haves, PMSC Chair). Phil was not able to attend the Research Subcommittee meeting and Srinivas Katipamula reported on his behalf.

This project is completed.

ACTION: PMS need to fill the close out form

c. 1312-RP: Tools for Evaluating FDD Methods for AHUs. Srinivas Katipamula reported on this project. Drexel University is the contractor. Phil Haves is the PMS chair. A conference call of the PMS will be held on Tuesday.

The status of the project as of 7 to 8 months ago was as follows. The contractor was putting together a simulation environment for evaluating FDD. They plan to use the dynamic cooling coil model from TC 7.4 project in the environment. The simulation environment is essentially complete except for debugging a few new modules. After debugging, they will then integrate the cooling coil model.

The contractor has completed the fault free model and is in the process of validating the model with experiment data from Iowa Energy Center.
The contractor asked for a no cost extension either by six month or by one year. To be decided in PMS meeting.

4. The fourth order of business was to briefly review the key RTAR and workstatement by the topical subcommittees. RTAR to be voted in the general meeting on Tuesday as follows.
    i. Development of metrics to evaluate the benefits of sensor networks for buildings (Bill Healy, lead)
    ii. Rich Hackner. Demand response optimization protocol and integrated training.
    iii. Fault detection and diagnosis for supermarket. John House needs to provide a revised WS before March and vote electronically.

5. New Business

Ideas were suggested for new research including:

a. Demand response with outside air flow rate reduction (Glenn Remington)

b. Bob Old, Rich Hackner want to help in drafting an RTAR.

Strategic research plan (Mike Brambley)

c. Peng Xu, Rich Hackner, Jin Wen, Bob old, Haorong Li want to be involved in the discussion also.

6. Adjourned at 3:00 pm.

Appendix G.
Program Notes

Important Program Deadlines

DEADLINES
The following deadlines apply for the next several months. Please recognize that they are not arbitrarily set, but are set to meet subsequent events. So if you miss them, your input may be delayed for six months or in some cases, for a year. All submissions should be sent to the Manager of Research and Technical Services (MORTS), Mike Vaughn, (morts@ashrae.net).

February 9, 2007	Date for all completed program packages to be submitted and technical papers to complete review process for 2007 Annual meeting in Long Beach, CA.
March 1, 2007	Conditionally approved tentative research projects that are approved for bid or re-bids must have all conditions satisfied with section Research Liaison and be in the hands of the MORTS by this date if they are to be eligible for bid in the spring 2007.
March 15, 2007	Spring 2007 tentative research projects (TRPs) are released for bid.
April 16, 2007	Completed TC/TG/TRG Meeting room request form for 2007 Long Beach meeting due to Judy Marshall at ASHRAE HQ. Subcommittee meeting rooms must be requested each meeting or they will be dropped automatically.
May 15, 2007	Bids are due for all TRPs released in spring 2007.
May 15, 2007	New or revised Work Statements and RTARs are due to MORTS for RAC consideration at the 2007 annual meeting.
June 26, 2007 Midnight	Contractor recommendations are due to MORTS for all TRPs bid in spring 2007. Place the Proposal Evaluation Summary sheet in MORTS lockbox outside ASHRAE Headquarters Room in Long Beach.

Other Ideas for Dallas and Beyond

Seminar *"Peel and Stick....The Future in HVAC Sensing Technology?"*
Lead: Michael Brambley
Co-Sponsors: TC 1.4?
Possible Speakers: Mike Schell and Glen Remington

Forum *"FDD Needs for Data Centers"*
Lead: Phil Haves
Co-Sponsors: TC 7.4, TC 9.9 Mission Critical Facilities?

Forum *"What Makes a Smart Building "Smart""*
Lead: ???
Co-Sponsors: TC 7.4

Appendix H.
1274-RP PMSC Notes
January 27, 2007, Dallas
PMSC meeting minutes

Contractor:

Taghi Alezera – ADM Associates
Dan Mort – ADM Associates

PMS Members Present:

Steve Blanc – PG&E
Michael Brambley - PNNL
Ken Peet – LSE Engineering
Keith Temple - FDSI

Guests Present: none

PMS Members Absent:

Todd Rossi – PMS Chair
Chris Scruton - CEC
Jim Braun – Purdue University
Pantelis Hatzikazakis – Lennox Industries

1. Since the last meeting the contractor had revised the document "Field Diagnostic Test On-Site Procedure for Roof Top Unitary Equipment" on October 17, 2006 and January 24, 2007. The revisions were distributed by e-mail.
2. The contractor provided a PowerPoint presentation summarizing the status of the project. The contractor also provided sample data and diagnostics for 12 units.
3. The contractor expressed concern with obtaining timely responses from the PMS. The contractor also indicated the need to have the procedure document approved in order to start testing in May and complete the project.
4. The PMS and Contractor agreed to the following items:
    a. The contractor will expand the diagnostics presented in Table 7.3 to include low and high indoor airflow problems based on the normalized airflow rate (cfm/ton).
    b. The contractor will expand the diagnostics presented in Table 7.3 to include faulty expansion device problem(s) based on information to be provided by Keith Temple.
    c. The Contractor will clarify how the diagnostic rules are implemented (precedence, etc.).
    d. Field data collection protocol defined and tested by the Contractor is acceptable to the PMS.
    e. The remaining 204 units to be tested shall be classified as "faulty" or "not faulty" after the baseline testing and application of the diagnostics.
    f. The 51 units to receive servicing shall be serviced in accordance with the Servicing procedure to be approved by the PMS.

g. The Contractor will update the procedure document to include revisions to the diagnostics, clarifications, and calculations contained in other documents (normalization of efficiency, etc.)

h. The remaining number of tests to be completed (204 baseline and 51 post-servicing) are adequate to meet the project requirements.

i. The efficiency measurements for the post-servicing units are intended to assess the overall improvement in performance for each unit. The measurements are not intended to assess the improvement in performance associated with individual service measures.

5. Ken Peet and Keith Temple agreed to provide a draft revision of the field Servicing procedure, based on Section 7.3 of the procedure document. Refer to schedule below.
6. The PMS will review the proposed plan, including review by the PMS chair Todd Rossi, and will approve the plan (with any revisions) by February 16, 2007.
7. The contractor will need a no cost extension for the project, from April 30, 2007 to April 30, 2008. Mike Brambley will request approval at the TC 7.5 meeting.
8. The following schedule was agreed upon:

Item	Responsible	Due Date
Update "Field Diagnostic Test On-Site Procedure for Roof Top Unitary Equipment"	Contractor	
Provide information on expansion valve faults to Contractor	Keith Temple	February 9, 2007
Draft revision to section 7.3 Maintenance and Servicing	Ken Peet and Keith Temple	February 16, 2007 to Mike and Steve for review
Review revision to section 7.3 Maintenance and Servicing	Mike Brambley and Steve Blanc	February 23, 2007 comments to Ken and Keith
Update revision to section 7.3 Maintenance and Servicing	PMS	March 2, 2007 to Contractor
Respond to proposed revision to section 7.3 Maintenance and Servicing	Contractor	March 9, 2007 response to Committee
Prepare outline for final report	Contractor	

Table 7.3 RTU Operational Fault Detection and Diagnostics Matrix

Problem	Type	ET	SH_m	CTD	SC_m	COA	ETD
Inefficient Compressor	All	⇑*					
Liquid-line restriction	All	⇓	⇑		⇑		
Condenser fouling	All			⇑	- /⇓	⇑	
Evaporator fouling	All	⇓	⇓				-/⇑

Refrigerant –Low charge	TXV	⇓			⇓	- /⇓	
Refrigerant –Low charge	nTXV	⇓	⇑		- /⇓		
Refrigerant – High Charge	TXV	- /⇑	- /⇓		⇑		
Refrigerant – High Charge	nTXV	- /⇑	⇓				
Refrigerant – Non condensibles	All			- /⇓	- /⇑	⇑	

Symbols: ⇑ = parameter higher than normal range

⇓ = parameter lower than normal range

- = normal

⇑* = High range starts 15° above ET target value.

Please send any corrections or additions to these minutes to Keith Temple (katemple@fielddiagnostics.com)

E-mail directory:
Contractor:
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PMS:

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Appendix I.
1275-RP PMSC Notes

See Appendix F, item 3.b.

Appendix J.
1312-RP PMSC Notes

January 30, 2007

Philip Haves, PMS Chair

The goal of the project is to develop a simulation-based testing environment for fault detection and diagnosis tools for air handling units. The contractor is Drexel University and the PI is Jin Wen. The project started in September 2005 and is due to finish in August 2007.

An HVACSIM+ model of one of the four zone single duct VAV systems at the Iowa Energy Center's Energy Resource Center (ERS) has been produced, based on the component models produced in 825-RP. Several component models have been adapted to represent the particular mechanical equipment and controls at the ERS.

The next task is to validate the individual component models and then the system model by comparing their performance predictions with measurements from the ERS. This will take place in two phases – first a comparison with previous measurements at the facility and then a series of experiments in which the contractor will make the additional measurements required. The following task will be to add faults to the models and validate their implementation.

Appendix K.
List of Subcommittee and Committee Attendees

Dallas– January 2007

FullName	TC Affiliation	General Mtg	SubCommittee Attended
Bill Healy	Voting Member	TRUE	FDD, Wireless, BUI, Research
Robert Old	Voting Member	TRUE	FDD, Wireless, BUI, Research
Carol Lomonaco	Voting Member	TRUE	FDD, Wireless, BUI
Jim Braun	Voting Member	TRUE	FDD, Wireless, BUI
James Gartner	Voting Member	TRUE	FDD, Wireless, BUI
Jin Wen	Voting Member	TRUE	FDD, wireless, Interface, research
Michael Brandemuehl	Voting Member	TRUE	
Peng Xu	Voting Member	TRUE	Wireless
Rich Hackner	Voting Member	TRUE	FDD, Wireless, BUI
Steven Blanc	Voting Member	TRUE	FDD, BUI, Wireless, Research
Jonathan Wright	International Voting Member	TRUE	FDD, Wireless, BUI
Ashish Singhal	Guest	TRUE	FDD, Wireless, BUI
Shengwei Wang	Guest	TRUE	FDD
Jeffrey Schein	guest	TRUE	FDD, Wireless, BUI
Pornsak Songkakul	Guest	TRUE	FDD, Wireless, BUI
Vernon A. Smith	Corresponding Member?	TRUE	FDD, Wireless, BUI
Carlos Haiad	Corresponding Member	TRUE	BUI
Glenn Remington	Corresponding Member	TRUE	FDD, Wireless, BUI
Jerine Ahmed	Corresponding Member	TRUE	No
Keith Temple	Corresponding Member	TRUE	FDD, Wireless, BUI
Gene Strehlow	Corresponding ?	TRUE	Subc
Haorong Li	Corresponding	TRUE	FDD, Wireless, BUI
David Bornside	CM?	TRUE	
Barry Bridges	CM	TRUE	Subc
Srinivas Katipamula	CM	TRUE	All
Michael Brambley	Chair, Voting Member	TRUE	FDD, Wireless, Building/Utility Interface
Natascha Castro		TRUE	FDD, Wireless, BUI, Research
Vance Payne		TRUE	FDD, Wireless

Sharon Dinges	Guest - member of SSPC135	FALSE	Subc
Christian R Taber	Guest	FALSE	
David Holmberg	Guest	FALSE	Wireless, BUI
Gary Kasper	guest	FALSE	Subc
Martha Brook	Guest	FALSE	FDD, BUI, Wireless
Yosuke Nishi	Guest	FALSE	Subc
Peter Armstrong	Guest	FALSE	FDD
Stephen Roth	Guest	FALSE	No
Wayne Webster	Guest	FALSE	No
Lingying Zhao	Guest	FALSE	Subc
Daniel Choiniere	Corresponding Member	FALSE	FDD
James Butler	Corresponding Member	FALSE	FDD